BINOCULAR BENT-AXIS LOUPES

FIELD OF THE INVENTION

This invention relates to binoculars or loupes and more particularly to loupes which allow a viewer to closely and conveniently observe an object which is being manipulated by the hands of the viewer below the normal level of eyesight.

BACKGROUND OF THE INVENTION

When performing surgery, for example, a surgeon relies on a high level of eye hand co-ordination generally with a small margin for error and so to enhance the precision and accuracy of the surgery it is necessary to magnify the region of the operation. Operating optical microscopes which comprise optical devices mounted on fixed stands have been used by surgeons for this purpose. However the field of view of these microscopes is set at the beginning of an operation and is not easily reset if a surgeon needs to alter the field of view to gain a better perspective of the operation or of the operating region.

It is also common for surgeons to wear small head mounted binoculars or loupes to magnify their field of view. However as the level of an operation is below the normal level of eyesight of the surgeon, the head of the surgeon must be inclined to enable him to watch and co-ordinate his hands. During long operations even a slight inclination of the head can overwork the muscles of the neck discomforting the surgeon and providing an additional unnecessary distraction. This problem is compounded by the weight of the head mounted loupes.

To allow a surgeon to sit and concentrate in one position for a long length of time and reduce the stress on the muscles of the neck it is preferable that the head and neck of the surgeon be in an upright aligned position so that the surgeon's line of sight is straight ahead. However due to the level of an operation this position is not possible with existing loupes.

Furthermore this problem is not exclusively confined to those in the surgical profession. In fact any person such as a jeweller who is using existing loupes and manipulating very small objects for any length of time will encounter the same problems associated with inclination of the head, as the surgeon.

It is an object of the present invention to provide an apparatus which allows a person to view and co-ordinate his/her hands below the normal line of sight without having to incline his/her head and also to allow the person to readily change the field of view being magnified.

SUMMARY OF THE INVENTION

Accordingly the invention provides optical loupes comprising a pair of optical devices (2) mounted on a frame for attachment on the head of a user whereby each optical device is in proximity to a respective eye of the user, characterised in that, each said optical device has an ocular (3), and an objective (4) which defines a field of view, said ocular and objective each has an optical axis (41, 42), respectively, the optical axis (42) through the objective intersects with the optical axis (41) through the ocular in each case, and light transfer means (23) is located between said ocular and objective for redirecting light from the objective to the ocular whereby an object which appears in the field of view of the objective is capable of being viewed through the ocular.

By providing an apparatus whereby the optical axes of the objective and ocular intersect rather than project co-linearly, the light path from an image below the normal line of sight can be projected through the objective and redirected through the ocular to the eye of the viewer while the viewer is looking straight ahead. This allows the viewer to observe an object below the normal line of sight without the need to incline his/her head. Furthermore as the apparatus, in use, is attached to the head of the viewer the field of view observed can be changed simply by the viewer moving the position of his/her head.

BRIEF DESCRIPTION OF THE DRAWINGS

The forgoing and other features objects and advantages of the present invention will become more apparent from the following description of a preferred embodiment in which;

FIG. **1** is a side elevational view of an embodiment of the apparatus in accordance with the invention,

FIG. **2** is a partial plan view of the embodiment shown in FIG. **1**,

FIG. **3** is a sectional view of one of the optical devices through line **3**—**3** of FIG. **2**, and

FIG. **4** is a sectional view of a central light through line **4**—**4** of FIG. **2**.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The apparatus **1** in accordance with the embodiment is shown as having two optical devices **2** each with an ocular **3** and an objective **4**. The ocular **3** comprises a metal tube. **5** which contains ocular lenses **6**, **7** and field lens **8**. Metal tube **5** Is slidably mounted within ocular housing **9**. An eye guard or hood **10** is fitted to the proximal end of tube **5** and is held in position by thumb screw **11**.

An aluminum frame **12** is fastened to a support collar **13** of the ocular **3** by means of a locking screw **14**. The locking screw passes through an elongate hole **15** in the frame **12** which allows the ocular a limited amount of lateral movement on the frame. Prior to the tightening of the locking screw **14** the interpupillary distance between the two optical devices can be set by moving the locking screw **14** within the elongate hole **15**.

The ocular housing **9** is connected to plate assembly **16** plate assembly **16** is locked in position on the end of tube **20** by locking nut **21** which allows for optical axis alignment. Attached to plate assembly **16** is objective mounting collar **17**. A window **43** in tube **20** is provided to facilitate the optical axis alignment.

The objective comprises objective lenses **18**, **19** in the distal end of tube **20** which is mounted in objective mounting collar **17**. Objective cover **44** is screwed onto the distal end **20***a* of the tube **20** and is provided to reduce the amount of refracted light entering the objective. A further cover **22** is provided to enclose the optical path within the optical device.

To allow a viewer looking through the ocular to view an object below his normal level of sight without inclining his head the respective optical axis **41** through the ocular lens and the optical axis **42** through the objective lens intersect at an angle less then 180° and preferably greater than 90° and more preferably at an angle in the range 120°–150°, wherein ocular axis **41** is in line with the normal visual axis of the human user when looking straight ahead when the frame is attached to the head of the human user. In the preferred embodiment the angle of intersection is about 135°. To